

ENPH/PHYS 332 Electromagnetic Field Theory

Department: Mathematics, Physics and Engineering

Credit Hours: 3

Current Catalog Description:

Electrostatics; Laplace's Equation; the theory of dielectrics; magnetostatics; electromagnetic induction; magnetic fields of currents; Maxwell's equations. Credit for both ENPH 332 and PHYS 332 will not be awarded.

Course Schedule:

3 lecture hr/wk, 0 lab hr/wk

Coordinator:

Dr. Daniel K. Marble

Prerequisites by Topic:

PHYS 242 – Principles of Physics II (pre-requisite)

MATH 306 – Differential Equations (co-requisite)

MATH 333 – Calculus III (co-requisite)

Course Learning Goals and Program Outcomes Map:

The Program Outcomes for Engineering Physics are:

- A. an ability to apply knowledge of math, engineering & science
- B. an ability to design and conduct experiments, as well as to analyze and interpret data
- C. an ability to design system, component or process to meet needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- D. an ability to function on multi-disciplinary teams
- E. an ability to identify, formulate, and solve engineering problems
- F. an understanding of professional and ethical responsibility
- G. an ability to communicate effectively
- H. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- I. a recognition of need for, and ability to engage in life-long learning
- J. a knowledge of contemporary issues
- K. an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.
- L. a depth and breadth of knowledge in engineering and physics necessary to work in a multidisciplinary environment

Course Goals Upon completion of this course, students will	Program Outcome(s):
1. know Coulomb's law and be able to use it to solve for the electrostatic force applied upon a point charge by a collection of other point charges..	A, L
2. know the definitions of standard terms in electromagnetism including electric potential, electric field, magnetic field, magnetic vector potential, induction, capacitance, etc.	A, L
3. know the formula for the electric field due to an infinitesimal point charge and be able to use it to calculate the electric field due to either a collection of discrete point charges or a continuous surface, line or volume charge density.	A, L
4. know the formula for the electric potential due to an infinitesimal point charge and be able to use it to calculate the electric potential due to either a collection of discrete point charges or a continuous surface, line or volume charge density.	A, L
5. be able to find the electric field at a point in space given the electric potential	A, L
6. be able to apply Gauss' Law to solve for the electric field in an electrostatic problem that involves a high degree of symmetry.	A, L
7. be able to apply various solution techniques including the method images, separation of variables, and multipole expansions to solve Poisson's and Laplace's Equations.	A, L
8. know the meanings of polarization, displacement vector, and dielectric constant and be able to use these concepts to solve problems involving dielectric media.	A, L
9. be able to determine the magnetic field created by either a line, area, or volume current density.	A, L
10. be able to write Maxwell's equations in both integral and differential form.	A, L
11. be able to show that the solution to Maxwell's equations for time-varying fields in free space are electromagnetic waves with the speed c .	A, L
12. be able to apply mathematical techniques necessary to solve E&M problems including the application of vectors, vector and integral calculus, dirac delta functions, and Kronecker delta functions .	A,L

Academic Honesty:

Cheating, plagiarism (submitting another person's materials or ideas as one's own), or doing work for another person who will receive academic credit are all-impermissible. This includes the use of unauthorized books, notebooks, or other sources in order to secure or give help during an examination, the unauthorized copying of examinations, assignments, reports, or term papers, or the presentation of unacknowledged material as if it were the student's own work. Disciplinary action may be taken beyond the academic discipline administered by the faculty member who teaches the course in which the cheating took place.

Students with Disabilities Policy:

It is the policy of Tarleton State University to comply with the Americans with Disabilities Act (ADA) and other federal, state, and local laws relative to the provision of disability services. Students with disabilities attending Tarleton State University may contact the Office of Disability Services at (254) 968-9478 to request appropriate accommodation. Furthermore, formal accommodation requests cannot be made until the student has been officially admitted to Tarleton State University.

Contribution of Course to Meeting the Professional Requirement:
Math/Science Topics: 100%

Status of Continuous Improvement Review of this Course:

Prepared by: Daniel K. Marble

Date: September 19, 2004

Reviewed by: Jim McCoy

Date: May 9, 2005